**Data Verification Module (DVM)**

The DVM is an internal review process used by the ADQM group to assist with the determination of data usability. The electronic data deliverables received from the laboratory are loaded into the Locus EIM™ database and processed through a series of data quality checks, which are a combination of software (Locus EIM™ database Data Verification Module (DVM)) and manual reviewer evaluations. The data is evaluated against the following data usability checks:

- Field and laboratory blank contamination
- US EPA hold time criteria
- Missing Quality Control (QC) samples
- Matrix spike(MS)/matrix spike duplicate (MSD) recoveries and the relative percent differences (RPDs) between these spikes
- Laboratory control sample(LCS)/control sample duplicate (LCSD) recoveries and the RPD between these spikes
- Surrogate spike recoveries for organic analyses
- RPD between field duplicate sample pairs
- RPD between laboratory replicates for inorganic analyses
- Difference / percent difference between total and dissolved sample pairs.

There are two qualifier fields in EIM:

**Lab Qualifier** is the qualifier assigned by the lab and may not reflect the usability of the data. This qualifier may have many different meanings and can vary between labs and over time within the same lab. Please refer to the laboratory report for a description of the lab qualifiers. As they are lab descriptors they are not to be used when evaluating the data.

**Validation Qualifier** is the 3rd party formal validation qualifier if this was performed. Otherwise this field contains the qualifier resulting from the ADQM DVM review process. This qualifier assesses the usability of the data and may not equal the lab qualifier. The DVM applies the following data evaluation qualifiers to analysis results, as warranted:

| Qualifier | Definition |
|---|---|
| B | Not detected substantially above the level reported in the laboratory or field blanks. |
| R | Unusable result. Analyte may or may not be present in the sample. |
| J | Analyte present. Reported value may not be accurate or precise. |
| UJ | Not detected. Reporting limit may not be accurate or precise. |

The **Validation Status Code** field is set to "DVM" if the ADQM DVM process has been performed. If the DVM has not been run, the field will be blank.

If the DVM has been run (**Validation Status Code** equals "DVM"), use the **Validation Qualifier.**

DVM Narrative Report

The DVM process was executed, but no data qualifiers were applied for this project.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

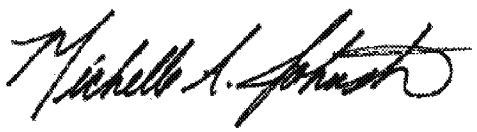
# ANALYTICAL REPORT

Job Number: 280-106447-1

Job Description: FAY-OLD OUTFALL SAMP 2/18

For:
Chemours Company FC, LLC The
c/o AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

Attention: Michael Aucoin



Approved for release.
Michelle A Johnston
Project Manager II
2/22/2018 8:03 AM

Michelle A Johnston, Project Manager II
4955 Yarrow Street, Arvada, CO, 80002
(303)736-0110
michelle.johnston@testamericainc.com
02/22/2018

cc: Barbara McGraw
Kelly Rinehimer

The test results in this report relate only to the samples in this report and meet all requirements of NELAC, with any exceptions noted. Pursuant to NELAP, this report shall not be reproduced except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the TestAmerica Denver Project Manager.

The Lab Certification ID# is 4025.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

# Table of Contents

# Table of Contents

## Qualifiers

### LCMS

| Qualifier | Qualifier Description |
|---|---|
| D | Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples. |
| 4 | MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable. |

## Glossary

| Abbreviation | These commonly used abbreviations may or may not be present in this report. |
|---|---|
| ¤ | Listed under the "D" column to designate that the result is reported on a dry weight basis |
| %R | Percent Recovery |
| CFL | Contains Free Liquid |
| CNF | Contains No Free Liquid |
| DER | Duplicate Error Ratio (normalized absolute difference) |
| Dil Fac | Dilution Factor |
| DL | Detection Limit (DoD/DOE) |
| DL, RA, RE, IN | Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample |
| DLC | Decision Level Concentration (Radiochemistry) |
| EDL | Estimated Detection Limit (Dioxin) |
| LOD | Limit of Detection (DoD/DOE) |
| LOQ | Limit of Quantitation (DoD/DOE) |
| MDA | Minimum Detectable Activity (Radiochemistry) |
| MDC | Minimum Detectable Concentration (Radiochemistry) |
| MDL | Method Detection Limit |
| ML | Minimum Level (Dioxin) |
| NC | Not Calculated |
| ND | Not Detected at the reporting limit (or MDL or EDL if shown) |
| PQL | Practical Quantitation Limit |
| QC | Quality Control |
| RER | Relative Error Ratio (Radiochemistry) |
| RL | Reporting Limit or Requested Limit (Radiochemistry) |
| RPD | Relative Percent Difference, a measure of the relative difference between two points |
| TEF | Toxicity Equivalent Factor (Dioxin) |
| TEQ | Toxicity Equivalent Quotient (Dioxin) |

# CASE NARRATIVE
# Client: The Chemours Company FC, LLC
# Project: FAY-OLD OUTFALL SAMP 2/18
# Report Number: 280-106447-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

For samples requiring analysis at a dilution, the dilution factor has been multiplied by the Method Detection Limit (MDL) for each analyte and evaluated versus the project-specific reporting limit (PSRL). If the obtained value is below the PSRL, then the PSRL is preserved as the reporting limit for the diluted result, otherwise, the obtained value becomes the reporting limit. This is done in order to maintain the PSRL to meet project requirements at the request of the client and to report the lowest possible RL for each analyte.

**Receipt**
The samples were received on 2/15/2018 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.7° C.

**Receipt Exceptions**
Per client instructions received on 2/15/2018 the job description was logged as FAY-OLD OUTFALL SAMP 2/18.

Per client request for expedited turn around time and laboratory operations approval the requested analyses were logged on a 5 business day turn around time.

No other anomalies were observed during sample receipt.

**Standards**
Analytical standards were prepared using the acid form of the compound Perfluoro(2-propoxypropanoic) acid (HFPO-DA).

The surrogate compound, 13C3 HFPO-DA was introduced at the extraction step and was used as an internal standard for quantitation of HFPO-DA. The concentration of the surrogate spike is 0.2ug/L in water samples or 50ug/kg in soil samples.

**Sample Extraction and Analysis**
The samples presented in this report were extracted for the target analyte by TestAmerica Denver's SOP DV-OP-0019, Rev. 8 and analyzed for the target analyte by TestAmerica Denver's SOP DV-LC-0012, Rev. 14, with the exceptions of the items indicated in the DuPont QAS. Sample FAY-VES-OLDOUTFALL-A (280-106447-2) was chosen to be analyzed as a duplicate and also to be spiked with the target analyte.

For water samples a 250mL aliquot of each sample is extracted using solid phase extraction technique with methanol conditioned Weak Anion Exchange cartridges. Each sample is spiked with the internal standard/surrogate, prior to extraction. After the sample is passed through the cartridge, the analytes are eluted with 2%Formic Acid, 6mLs of HPLC grade MeOH and then with 4mL of 10% ammonium hydroxide in methanol. The final volume is brought to 5mL using reagent water and the extract is analyzed by LC/MS/MS.

The target analyte is separated from other components on a high-performance liquid chromatography (HPLC) C18 column with a mobile phase mixture of water containing 0.1% ammonium acetate and methanol. The mass spectrometer detector is operated in the electrospray (ESI) negative ion mode. The instrument is calibrated at 7 concentration levels (0.2, 0.5, 1.0, 2.0, 5.0, 10 and 20ug/L). The target analyte is detected as the perfluoro(2-propoxypropanoic) acid with the parent ion of 328.8 amu. The daughter ions used for analysis by LC/MS/MS are at 284.8 amu. The ratio of the peak areas to the two ions must be ±20% of the ion ratios in the mid-point ICAL for qualitative identification. Sample results are quantitated using the internal standard dilution.

**Tuning and Calibration**
The instrument is tuned with a solution of the target analyte such that mass assignments are within ±0.5 amu of the daughter ions. The instrument is calibrated with seven concentration levels from 0.2ug/L to 20ug/L. Linear regression ($y=ax+b$) or quadratic functions (y=ax+cx2+b) are used with a correlation coefficient or coefficient of determination ≥0.990.
Following initial calibration (ICAL), an initial calibration blank (ICB) is tested, which consists of methanol spiked with the surrogate. The result for the target analyte must be less than one half the reporting limit (RL) to proceed.

Next an initial calibration verification (ICV) standard is tested. This is a mid-level concentration standard from a different vendor from the ICAL standard. If a different vendor is not available then, a different lot number from the same vendor is used. The ICV must be within 80-120% of the true value.

The quantitation limit verification standard is a standard from the same source as the ICAL tested run at the RL level to determine accuracy near the detection limit. This recovery must be within 70-130%.

Continuing calibration verification (CCV) standards are tested every 10 injections and are from the same source as the ICAL and are at mid-level concentration. The recovery of the CCVs must be 70-130% or recalibration is necessary.

**Method QC Samples**

The Method Blank is processed reagent water spiked with internal standard and prepared with each batch of 20 samples of the same matrix. All samples in the batch are processed at the same time and with the same reagents. The method blank must be less than the LOD or associated batch samples must be re-extracted and reanalyzed.

Each batch is prepared with a low- and a mid-level concentration spike Laboratory Control Samples (LCS). The recoveries of these samples must be within 70-130% or associated batch samples must be re-extracted and reanalyzed. If the recovery is biased high and samples are non-detect, results can be reported without re-extraction.

**Calculations**

Sample Result Calculation

For internal standard quantitation,
HFPO-DA Response = Area of HFPO-DA * 13C3 HFPO-DA concentration / area of 13C3 HFPO-DA

Concentration in waters, ug/L = (Cex Vt)/(Vo)

Where:
Cex = Concentration measured in sample extract from the target analyte response (ng/mL)
Vt = Volume of total extract (mL)
Vo = Volume of water extracted (mL)

2. Percent Recovery Calculation

Spike Recovery = (SSR-SR)/(SA)x100%

Where:
SSR = Spike sample result
SR = Sample result
SA = Spike added

3. Relative Percent Difference Calculation

RPD = (SR - DR)/(1/2(SR+DR))x100

Where:
SR = Sample result
DR = Duplicate result

**HFPO-DA Analysis Anomalies**

Samples FAY-VES-OLDOUTFALL-A-D (280-106447-1), FAY-VES-OLDOUTFALL-A (280-106447-2), FAY-VES-OLDOUTFALL-B (280-106447-3), FAY-VES-OLDOUTFALL-C (280-106447-4), FAY-VES-OLDOUTFALL-D (280-106447-5), FAY-VES-OLDOUTFALL-E (280-106447-6), FAY-VES-OLDOUTFALLSEEP-A (280-106447-7), FAY-VES-OLDOUTFALLCREEK-A (280-106447-8), FAY-VES-OLDOUTFALLCREEK-A2 (280-106447-9), FAY-VES-OLDOUTFALLCREEK-A3 (280-106447-10), FAY-VES-OLDOUTFALLCREEKWATERBO (280-106447-11) and FAY-VES-FB-021418 (280-106447-12) were analyzed for Perfluorinated Hydrocarbons in accordance with DV-LC-0012. The samples were prepared on 02/20/2018 and analyzed on 02/21/2018.

Calibration 9 (STD125) has been included in the raw data, but was not used in the Initial Calibration (ICAL).

Reporting limits have been adjusted accordingly for the initial volumes extracted.

The following sample was decanted prior to preparation: FAY-VES-OLDOUTFALLSEEP-A (280-106447-7).

Each sample is analyzed to achieve the lowest possible reporting limits within the constraints of the method. Due to analytes present above the calibration range, samples FAY-VES-OLDOUTFALL-A-D (280-106447-1), FAY-VES-OLDOUTFALL-A (280-106447-2), FAY-VES-OLDOUTFALL-A (280-106447-2[DU]), FAY-VES-OLDOUTFALL-A (280-106447-2[MS]), FAY-VES-OLDOUTFALL-B (280-106447-3), FAY-VES-OLDOUTFALL-C (280-106447-4), FAY-VES-OLDOUTFALL-D (280-106447-5), FAY-VES-OLDOUTFALL-E (280-106447-6), FAY-VES-OLDOUTFALLCREEK-A (280-106447-8), FAY-VES-OLDOUTFALLCREEK-A2 (280-106447-9), FAY-VES-OLDOUTFALLCREEK-A3 (280-106447-10) and FAY-VES-OLDOUTFALLCREEKWATERBO (280-106447-11) had to be analyzed at dilutions. The reporting limits have been adjusted relative to the dilutions required.

The MS and Sample Duplicate associated with prep batch 280-405473 were performed on sample FAY-VES-OLDOUTFALL-A (280-106447-2). The MS spike compound recovery and surrogate recovery could not be reliably calculated for HPFO-DA and 13C3 HFPO-DA because the sample concentrations were greater than four times the spike amounts. The acceptable low-level LCS and mid-level LCS/LCSD analysis data indicated that the analytical system was operating within control; therefore, corrective action was

deemed unnecessary.

No other analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

# Fluorochemical Characterization of Water Samples
# Analytical Results

| Chemours Sample Identification | TestAmerica Sample Identification | Collection Date/Time | Date Sample Received by TestAmerica | Analysis Date | HFPO-DA# (ug/L**) |
|---|---|---|---|---|---|
| FAY-VES-OLDOUTFALL-A-D | 280-106447-1 | 2/14/2018 12:00 | 2/15/2018 | 2/21/2018 | 7.1 |
| FAY-VES-OLDOUTFALL-A | 280-106447-2 | 2/14/2018 12:00 | 2/15/2018 | 2/21/2018 | 7.6 |
| FAY-VES-OLDOUTFALL-B | 280-106447-3 | 2/14/2018 12:45 | 2/15/2018 | 2/21/2018 | 7.3 |
| FAY-VES-OLDOUTFALL-C | 280-106447-4 | 2/14/2018 13:38 | 2/15/2018 | 2/21/2018 | 9.7 |
| FAY-VES-OLDOUTFALL-D | 280-106447-5 | 2/14/2018 14:05 | 2/15/2018 | 2/21/2018 | 13 |
| FAY-VES-OLDOUTFALL-E | 280-106447-6 | 2/14/2018 14:15 | 2/15/2018 | 2/21/2018 | 11 |
| FAY-VES-OLDOUTFALLSEEP-A | 280-106447-7 | 2/14/2018 13:10 | 2/15/2018 | 2/21/2018 | 1.3 |
| FAY-VES-OLDOUTFALLCREEK-A | 280-106447-8 | 2/14/2018 13:22 | 2/15/2018 | 2/21/2018 | 2.3 |
| FAY-VES-OLDOUTFALLCREEK-A2 | 280-106447-9 | 2/14/2018 16:30 | 2/15/2018 | 2/21/2018 | 2.5 |
| FAY-VES-OLDOUTFALLCREEK-A3 | 280-106447-10 | 2/14/2018 16:45 | 2/15/2018 | 2/21/2018 | 2.2 |
| FAY-VES-OLDOUTFALLCREEKWATERBO | 280-106447-11 | 2/14/2018 17:00 | 2/15/2018 | 2/21/2018 | 1.8 |
| FAY-VES-FB-021418 | 280-106447-12 | 2/14/2018 7:00 | 2/15/2018 | 2/21/2018 | <0.010 |

# HFPO-DA – hexafluoropropylene oxide dimer acid, analyzed by method DV-LC-0012, Revision 14.
< = less than the stated value
** ug/L – micrograms/liter (parts per billion)
*** The MS spike compound recoveries and surrogate recoveries could not be reliably calculated because the sample concentration was greater than four times the spike amounts.

**DEFINITIONS:**
Reporting Limit (RL) for the procedure is approximately 0.010ug/L.

**RESULTS ARE CALCULATED ACCORDING TO THE FOLLOWING CRITERIA:**
For samples analyzed in duplicate:
If the sample and laboratory duplicate are greater than 5X RL, the relative percent difference (RPD) is less than 20, the average value is reported. If the RPD is greater than 20, the higher value is reported.

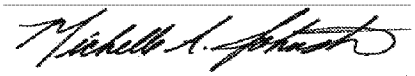
If the sample or laboratory duplicate are less than 5X RL, and the absolute difference is less than RL, the average value is reported. If the absolute difference is greater than the RL, the higher value is reported.

Matrix Spike Recoveries: Acceptable Range: 70%-130%

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

| TestAmerica Sample ID | Matrix Spike Recoveries |
|---|---|
| 280-106447-2 | 163%*** |

**SUBMITTED BY:**



2/22/2018

Michelle A. Johnston, Project Manager Date

**8321A : HFPO-DA**

| Lab Sample ID | Client Sample ID | Analyte | Individual Result (ug/L) | Final Result (ug/L) | RL |
|---|---|---|---|---|---|
| 280-106447-1 | FAY-VES-OLDOUTFALL-A-D | HFPO-DA | 7.1 | 7.1 | 0.044 |
| 280-106447-2 | FAY-VES-OLDOUTFALL-A | HFPO-DA | 7.4 | 7.6 | 0.043 |
| 280-106447-2 DU | FAY-VES-OLDOUTFALL-A | HFPO-DA | 7.8 | | 0.045 |
| 280-106447-3 | FAY-VES-OLDOUTFALL-B | HFPO-DA | 7.3 | 7.3 | 0.044 |
| 280-106447-4 | FAY-VES-OLDOUTFALL-C | HFPO-DA | 9.7 | 9.7 | 0.047 |
| 280-106447-5 | FAY-VES-OLDOUTFALL-D | HFPO-DA | 13 | 13 | 0.045 |
| 280-106447-6 | FAY-VES-OLDOUTFALL-E | HFPO-DA | 11 | 11 | 0.045 |
| 280-106447-7 | FAY-VES-OLDOUTFALLSEEP-A | HFPO-DA | 1.3 | 1.3 | 0.010 |
| 280-106447-8 | FAY-VES-OLDOUTFALLCREEK-A | HFPO-DA | 2.3 | 2.3 | 0.010 |
| 280-106447-9 | FAY-VES-OLDOUTFALLCREEK-A2 | HFPO-DA | 2.5 | 2.5 | 0.010 |
| 280-106447-10 | FAY-VES-OLDOUTFALLCREEK-A3 | HFPO-DA | 2.2 | 2.2 | 0.010 |
| 280-106447-11 | FAY-VES-OLDOUTFALLCREEKWATERBO | HFPO-DA | 1.8 | 1.8 | 0.010 |
| 280-106447-12 | FAY-VES-FB-021418 | HFPO-DA | <0.010 | <0.010 | 0.010 |

(a) Method 8321A

(b) DUP or REP indicates a laboratory duplicate.

(c) If the sample and laboratory duplicate are both greater than 5X the RL and the relative percent difference (RPD) is less than 20, the average value is reported. If the RPD is greater than 20, the higher of the sample and laboratory duplicate value is reported. If the sample and/or laboratory duplicate are less than 5X the RL, and the absolute difference between the sample and laboratory duplicate is less than the RL, the average value is reported. If the absolute difference is greater than the RL, the higher of the sample and laboratory duplicate value is reported. If either the sample or the duplicate result is greater than or equal to the RL and the other is less than the RL, then the higher of the two is reported.

(d) Moisture Determined by ASTM D2216.

(e) Reporting Limit (RL) = The concentration equivalent to the low calibration standard.

# Detection Summary

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

## Client Sample ID: FAY-VES-OLDOUTFALL-A-D — Lab Sample ID: 280-106447-1

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.1 | | 0.044 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALL-A — Lab Sample ID: 280-106447-2

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.4 | | 0.043 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALL-B — Lab Sample ID: 280-106447-3

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.3 | | 0.044 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALL-C — Lab Sample ID: 280-106447-4

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 9.7 | | 0.047 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALL-D — Lab Sample ID: 280-106447-5

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 13 | | 0.045 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALL-E — Lab Sample ID: 280-106447-6

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 11 | | 0.045 | | ug/L | 10 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALLSEEP-A — Lab Sample ID: 280-106447-7

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1.3 | | 0.010 | | ug/L | 1 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A — Lab Sample ID: 280-106447-8

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.3 | | 0.010 | | ug/L | 2 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A2 — Lab Sample ID: 280-106447-9

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.5 | | 0.010 | | ug/L | 2 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A3 — Lab Sample ID: 280-106447-10

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.2 | | 0.010 | | ug/L | 2 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEKWATERBO — Lab Sample ID: 280-106447-11

This Detection Summary does not include radiochemical test results.

## Client Sample ID: FAY-VES-OLDOUTFALLCREEKWATERBO (Continued)

Lab Sample ID: 280-106447-11

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1.8 | | 0.010 | | ug/L | 2 | | 8321A | Total/NA |

## Client Sample ID: FAY-VES-FB-021418

Lab Sample ID: 280-106447-12

No Detections.

This Detection Summary does not include radiochemical test results.

## Client Sample ID: FAY-VES-OLDOUTFALL-A-D

Lab Sample ID: 280-106447-1

Date Collected: 02/14/18 12:00
Matrix: Water
Date Received: 02/15/18 09:30

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.1 | | 0.044 | | ug/L | | 02/20/18 10:22 | 02/21/18 08:50 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *92* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 08:50* | *10* |

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

Client Sample ID: FAY-VES-OLDOUTFALL-A
Date Collected: 02/14/18 12:00
Date Received: 02/15/18 09:30

Lab Sample ID: 280-106447-2
Matrix: Water

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.4 | | 0.043 | | ug/L | | 02/20/18 10:22 | 02/21/18 08:54 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *89* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 08:54* | *10* |

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

Client Sample ID: FAY-VES-OLDOUTFALL-B
Date Collected: 02/14/18 12:45
Date Received: 02/15/18 09:30

Lab Sample ID: 280-106447-3
Matrix: Water

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.3 | | 0.044 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:04 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *90* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:04* | *10* |

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

Client Sample ID: FAY-VES-OLDOUTFALL-C
Date Collected: 02/14/18 13:38
Date Received: 02/15/18 09:30

Lab Sample ID: 280-106447-4
Matrix: Water

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 9.7 | | 0.047 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:07 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *86* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:07* | *10* |

## Client Sample ID: FAY-VES-OLDOUTFALL-D

Lab Sample ID: 280-106447-5

Date Collected: 02/14/18 14:05
Date Received: 02/15/18 09:30

Matrix: Water

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 13 | | 0.045 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:10 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *86* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:10* | *10* |

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

Client Sample ID: FAY-VES-OLDOUTFALL-E
Date Collected: 02/14/18 14:15
Date Received: 02/15/18 09:30

Lab Sample ID: 280-106447-6
Matrix: Water

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 11 | | 0.045 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:13 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *91* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:13* | *10* |

## Client Sample ID: FAY-VES-OLDOUTFALLSEEP-A

Lab Sample ID: 280-106447-7

Date Collected: 02/14/18 13:10
Matrix: Water
Date Received: 02/15/18 09:30

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1.3 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 08:24 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *75* | | *50 - 200* | *02/20/18 10:22* | *02/21/18 08:24* | *1* |

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A
Date Collected: 02/14/18 13:22
Date Received: 02/15/18 09:30

Lab Sample ID: 280-106447-8
Matrix: Water

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.3 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:17 | 2 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *83* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:17* | *2* |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A2

Lab Sample ID: 280-106447-9

Date Collected: 02/14/18 16:30
Date Received: 02/15/18 09:30

Matrix: Water

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.5 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:20 | 2 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *81* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:20* | *2* |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A3
**Lab Sample ID: 280-106447-10**

Date Collected: 02/14/18 16:45
Matrix: Water
Date Received: 02/15/18 09:30

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| **HFPO-DA** | **2.2** | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:26 | 2 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *83* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:26* | *2* |

**Client Sample ID: FAY-VES-OLDOUTFALLCREEKWATERBO**
**Lab Sample ID: 280-106447-11**
**Date Collected: 02/14/18 17:00**
**Matrix: Water**
**Date Received: 02/15/18 09:30**

**Method: 8321A - HFPO-DA**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1.8 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 09:30 | 2 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *85* | *D* | *50 - 200* | *02/20/18 10:22* | *02/21/18 09:30* | *2* |

## Client Sample ID: FAY-VES-FB-021418
**Lab Sample ID: 280-106447-12**

Date Collected: 02/14/18 07:00
Matrix: Water
Date Received: 02/15/18 09:30

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | <0.010 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 08:41 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *84* | | *50 - 200* | *02/20/18 10:22* | *02/21/18 08:41* | *1* |

# Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

## Method: 8321A - HFPO-DA

Prep: 3535

| Analyte | RL | MDL | Units | Method |
|---|---|---|---|---|
| HFPO-DA | 0.010 | 0.0051 | ug/L | 8321A |

# Surrogate Summary

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

## Method: 8321A - HFPO-DA

Matrix: Water

Prep Type: Total/NA

| | | Percent Surrogate Recovery (Acceptance Limits) |
|---|---|---|
| Lab Sample ID | Client Sample ID | HFPODA (50-200) |
| 280-106447-1 | FAY-VES-OLDOUTFALL-A-D | 92 D |
| 280-106447-2 | FAY-VES-OLDOUTFALL-A | 89 D |
| 280-106447-2 DU | FAY-VES-OLDOUTFALL-A | 79 D |
| 280-106447-2 MS | FAY-VES-OLDOUTFALL-A | 89 D |
| 280-106447-3 | FAY-VES-OLDOUTFALL-B | 90 D |
| 280-106447-4 | FAY-VES-OLDOUTFALL-C | 86 D |
| 280-106447-5 | FAY-VES-OLDOUTFALL-D | 86 D |
| 280-106447-6 | FAY-VES-OLDOUTFALL-E | 91 D |
| 280-106447-7 | FAY-VES-OLDOUTFALLSEEP- | 75 |
| 280-106447-8 | FAY-VES-OLDOUTFALLCREEI | 83 D |
| 280-106447-9 | FAY-VES-OLDOUTFALLCREEI | 81 D |
| 280-106447-10 | FAY-VES-OLDOUTFALLCREEI | 83 D |
| 280-106447-11 | FAY-VES-OLDOUTFALLCREEI | 85 D |
| 280-106447-12 | FAY-VES-FB-021418 | 84 |
| DLCK 280-404345/13 | Lab Control Sample | 104 |
| LCS 280-405473/2-A | Lab Control Sample | 81 |
| LCSD 280-405473/4-A | Lab Control Sample Dup | 79 |
| LLCS 280-405473/3-A | Lab Control Sample | 83 |
| MB 280-405473/1-A | Method Blank | 77 |

**Surrogate Legend**

HFPODA = 13C3 HFPO-DA

## Method: 8321A - HFPO-DA

**Lab Sample ID: DLCK 280-404345/13**
**Matrix: Water**
**Analysis Batch: 404345**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**

| Analyte | | | Spike Added | DLCK Result | DLCK Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | | | 0.250 | <0.50 | | ug/L | | 90 | 70 - 130 | | |

| *Surrogate* | *DLCK %Recovery* | *DLCK Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *104* | | *50 - 200* |

**Lab Sample ID: MB 280-405473/1-A**
**Matrix: Water**
**Analysis Batch: 405660**

**Client Sample ID: Method Blank**
**Prep Type: Total/NA**
**Prep Batch: 405473**

| Analyte | MB Result | MB Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | <0.010 | | 0.010 | | ug/L | | 02/20/18 10:22 | 02/21/18 07:42 | 1 |

| *Surrogate* | *MB %Recovery* | *MB Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *77* | | *50 - 200* | *02/20/18 10:22* | *02/21/18 07:42* | *1* |

**Lab Sample ID: LCS 280-405473/2-A**
**Matrix: Water**
**Analysis Batch: 405660**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 405473**

| Analyte | | | Spike Added | LCS Result | LCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | | | 0.200 | 0.191 | | ug/L | | 95 | 70 - 130 | | |

| *Surrogate* | *LCS %Recovery* | *LCS Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *81* | | *50 - 200* |

**Lab Sample ID: LCSD 280-405473/4-A**
**Matrix: Water**
**Analysis Batch: 405660**

**Client Sample ID: Lab Control Sample Dup**
**Prep Type: Total/NA**
**Prep Batch: 405473**

| Analyte | | | Spike Added | LCSD Result | LCSD Qualifier | Unit | D | %Rec | %Rec. Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | | | 0.200 | 0.197 | | ug/L | | 99 | 70 - 130 | 3 | 20 |

| *Surrogate* | *LCSD %Recovery* | *LCSD Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *79* | | *50 - 200* |

**Lab Sample ID: LLCS 280-405473/3-A**
**Matrix: Water**
**Analysis Batch: 405660**

**Client Sample ID: Lab Control Sample**
**Prep Type: Total/NA**
**Prep Batch: 405473**

| Analyte | | | Spike Added | LLCS Result | LLCS Qualifier | Unit | D | %Rec | %Rec. Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | | | 0.0200 | 0.0193 | | ug/L | | 97 | 70 - 130 | | |

| *Surrogate* | *LLCS %Recovery* | *LLCS Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *83* | | *50 - 200* |

## Method: 8321A - HFPO-DA (Continued)

**Lab Sample ID: 280-106447-2 MS** — **Client Sample ID: FAY-VES-OLDOUTFALL-A**
**Matrix: Water** — **Prep Type: Total/NA**
**Analysis Batch: 405660** — **Prep Batch: 405473**

| Analyte | Sample Result | Sample Qualifier | Spike Added | MS Result | MS Qualifier | Unit | D | %Rec | %Rec. Limits |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.4 | | 0.180 | 7.71 | 4 | ug/L | | 163 | 70 - 130 |

| *Surrogate* | *MS %Recovery* | *MS Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *89* | *D* | *50 - 200* |

**Lab Sample ID: 280-106447-2 DU** — **Client Sample ID: FAY-VES-OLDOUTFALL-A**
**Matrix: Water** — **Prep Type: Total/NA**
**Analysis Batch: 405660** — **Prep Batch: 405473**

| Analyte | Sample Result | Sample Qualifier | | DU Result | DU Qualifier | Unit | D | | | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 7.4 | | | 7.77 | | ug/L | | | | 5 | 20 |

| *Surrogate* | *DU %Recovery* | *DU Qualifier* | *Limits* |
|---|---|---|---|
| *13C3 HFPO-DA* | *79* | *D* | *50 - 200* |

## LCMS

### Analysis Batch: 404345

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| DLCK 280-404345/13 | Lab Control Sample | Total/NA | Water | 8321A | |

### Prep Batch: 405473

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 280-106447-1 | FAY-VES-OLDOUTFALL-A-D | Total/NA | Water | 3535 | |
| 280-106447-2 | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 3535 | |
| 280-106447-3 | FAY-VES-OLDOUTFALL-B | Total/NA | Water | 3535 | |
| 280-106447-4 | FAY-VES-OLDOUTFALL-C | Total/NA | Water | 3535 | |
| 280-106447-5 | FAY-VES-OLDOUTFALL-D | Total/NA | Water | 3535 | |
| 280-106447-6 | FAY-VES-OLDOUTFALL-E | Total/NA | Water | 3535 | |
| 280-106447-7 | FAY-VES-OLDOUTFALLSEEP-A | Total/NA | Water | 3535 | |
| 280-106447-8 | FAY-VES-OLDOUTFALLCREEK-A | Total/NA | Water | 3535 | |
| 280-106447-9 | FAY-VES-OLDOUTFALLCREEK-A2 | Total/NA | Water | 3535 | |
| 280-106447-10 | FAY-VES-OLDOUTFALLCREEK-A3 | Total/NA | Water | 3535 | |
| 280-106447-11 | FAY-VES-OLDOUTFALLCREEKWATERBO | Total/NA | Water | 3535 | |
| 280-106447-12 | FAY-VES-FB-021418 | Total/NA | Water | 3535 | |
| MB 280-405473/1-A | Method Blank | Total/NA | Water | 3535 | |
| LCS 280-405473/2-A | Lab Control Sample | Total/NA | Water | 3535 | |
| LCSD 280-405473/4-A | Lab Control Sample Dup | Total/NA | Water | 3535 | |
| LLCS 280-405473/3-A | Lab Control Sample | Total/NA | Water | 3535 | |
| 280-106447-2 MS | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 3535 | |
| 280-106447-2 DU | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 3535 | |

### Analysis Batch: 405660

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 280-106447-1 | FAY-VES-OLDOUTFALL-A-D | Total/NA | Water | 8321A | 405473 |
| 280-106447-2 | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 8321A | 405473 |
| 280-106447-3 | FAY-VES-OLDOUTFALL-B | Total/NA | Water | 8321A | 405473 |
| 280-106447-4 | FAY-VES-OLDOUTFALL-C | Total/NA | Water | 8321A | 405473 |
| 280-106447-5 | FAY-VES-OLDOUTFALL-D | Total/NA | Water | 8321A | 405473 |
| 280-106447-6 | FAY-VES-OLDOUTFALL-E | Total/NA | Water | 8321A | 405473 |
| 280-106447-7 | FAY-VES-OLDOUTFALLSEEP-A | Total/NA | Water | 8321A | 405473 |
| 280-106447-8 | FAY-VES-OLDOUTFALLCREEK-A | Total/NA | Water | 8321A | 405473 |
| 280-106447-9 | FAY-VES-OLDOUTFALLCREEK-A2 | Total/NA | Water | 8321A | 405473 |
| 280-106447-10 | FAY-VES-OLDOUTFALLCREEK-A3 | Total/NA | Water | 8321A | 405473 |
| 280-106447-11 | FAY-VES-OLDOUTFALLCREEKWATERBO | Total/NA | Water | 8321A | 405473 |
| 280-106447-12 | FAY-VES-FB-021418 | Total/NA | Water | 8321A | 405473 |
| MB 280-405473/1-A | Method Blank | Total/NA | Water | 8321A | 405473 |
| LCS 280-405473/2-A | Lab Control Sample | Total/NA | Water | 8321A | 405473 |
| LCSD 280-405473/4-A | Lab Control Sample Dup | Total/NA | Water | 8321A | 405473 |
| LLCS 280-405473/3-A | Lab Control Sample | Total/NA | Water | 8321A | 405473 |
| 280-106447-2 MS | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 8321A | 405473 |
| 280-106447-2 DU | FAY-VES-OLDOUTFALL-A | Total/NA | Water | 8321A | 405473 |

## Client Sample ID: FAY-VES-OLDOUTFALL-A-D

Lab Sample ID: 280-106447-1
Matrix: Water
Date Collected: 02/14/18 12:00
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 288.9 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 08:50 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-A

Lab Sample ID: 280-106447-2
Matrix: Water
Date Collected: 02/14/18 12:00
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 295.8 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 08:54 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-B

Lab Sample ID: 280-106447-3
Matrix: Water
Date Collected: 02/14/18 12:45
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 292.6 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 09:04 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-C

Lab Sample ID: 280-106447-4
Matrix: Water
Date Collected: 02/14/18 13:38
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 270.9 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 09:07 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-D

Lab Sample ID: 280-106447-5
Matrix: Water
Date Collected: 02/14/18 14:05
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 283.5 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 09:10 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-E

Lab Sample ID: 280-106447-6
Matrix: Water
Date Collected: 02/14/18 14:15
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 281 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 09:13 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALLSEEP-A

Lab Sample ID: 280-106447-7
Date Collected: 02/14/18 13:10
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 287.4 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 08:24 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A

Lab Sample ID: 280-106447-8
Date Collected: 02/14/18 13:22
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 293.6 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 2 | | | 405660 | 02/21/18 09:17 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A2

Lab Sample ID: 280-106447-9
Date Collected: 02/14/18 16:30
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 290 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 2 | | | 405660 | 02/21/18 09:20 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEK-A3

Lab Sample ID: 280-106447-10
Date Collected: 02/14/18 16:45
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 294.9 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 2 | | | 405660 | 02/21/18 09:26 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALLCREEKWATERBO

Lab Sample ID: 280-106447-11
Date Collected: 02/14/18 17:00
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 294.1 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 2 | | | 405660 | 02/21/18 09:30 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-FB-021418

Lab Sample ID: 280-106447-12
Date Collected: 02/14/18 07:00
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 293.5 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 08:41 | AGCM | TAL DEN |

## Client Sample ID: Method Blank
**Lab Sample ID: MB 280-405473/1-A**

Date Collected: N/A
Matrix: Water
Date Received: N/A

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 250 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 07:42 | AGCM | TAL DEN |

## Client Sample ID: Lab Control Sample
**Lab Sample ID: DLCK 280-404345/13**

Date Collected: N/A
Matrix: Water
Date Received: N/A

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Analysis | 8321A | | 1 | | | 404345 | 02/08/18 13:38 | AGCM | TAL DEN |

## Client Sample ID: Lab Control Sample
**Lab Sample ID: LCS 280-405473/2-A**

Date Collected: N/A
Matrix: Water
Date Received: N/A

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 250 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 07:45 | AGCM | TAL DEN |

## Client Sample ID: Lab Control Sample Dup
**Lab Sample ID: LCSD 280-405473/4-A**

Date Collected: N/A
Matrix: Water
Date Received: N/A

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 250 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 07:52 | AGCM | TAL DEN |

## Client Sample ID: Lab Control Sample
**Lab Sample ID: LLCS 280-405473/3-A**

Date Collected: N/A
Matrix: Water
Date Received: N/A

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 250 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 1 | | | 405660 | 02/21/18 07:49 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-A
**Lab Sample ID: 280-106447-2 MS**

Date Collected: 02/14/18 12:00
Matrix: Water
Date Received: 02/15/18 09:30

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 278.2 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 09:00 | AGCM | TAL DEN |

## Client Sample ID: FAY-VES-OLDOUTFALL-A

Date Collected: 02/14/18 12:00
Date Received: 02/15/18 09:30

## Lab Sample ID: 280-106447-2 DU

Matrix: Water

| Prep Type | Batch Type | Batch Method | Run | Dil Factor | Initial Amount | Final Amount | Batch Number | Prepared or Analyzed | Analyst | Lab |
|---|---|---|---|---|---|---|---|---|---|---|
| Total/NA | Prep | 3535 | | | 280.9 mL | 5 mL | 405473 | 02/20/18 10:22 | DFB1 | TAL DEN |
| Total/NA | Analysis | 8321A | | 10 | | | 405660 | 02/21/18 08:57 | AGCM | TAL DEN |

**Laboratory References:**

TAL DEN = TestAmerica Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

# Accreditation/Certification Summary

Client: Chemours Company FC, LLC The
TestAmerica Job ID: 280-106447-1
Project/Site: FAY-OLD OUTFALL SAMP 2/18

## Laboratory: TestAmerica Denver

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

| Authority | Program | EPA Region | Identification Number | Expiration Date |
|---|---|---|---|---|
| North Carolina (WW/SW) | State Program | 4 | 358 | 12-31-18 |

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

| Analysis Method | Prep Method | Matrix | Analyte |
|---|---|---|---|
| 8321A | 3535 | Water | HFPO-DA |

# Method Summary

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

| Method | Method Description | Protocol | Laboratory |
|---|---|---|---|
| 8321A | HFPO-DA | SW846 | TAL DEN |

**Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

**Laboratory References:**

TAL DEN = TestAmerica Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

# Sample Summary

Client: Chemours Company FC, LLC The
Project/Site: FAY-OLD OUTFALL SAMP 2/18

TestAmerica Job ID: 280-106447-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received |
|---|---|---|---|---|
| 280-106447-1 | FAY-VES-OLDOUTFALL-A-D | Water | 02/14/18 12:00 | 02/15/18 09:30 |
| 280-106447-2 | FAY-VES-OLDOUTFALL-A | Water | 02/14/18 12:00 | 02/15/18 09:30 |
| 280-106447-3 | FAY-VES-OLDOUTFALL-B | Water | 02/14/18 12:45 | 02/15/18 09:30 |
| 280-106447-4 | FAY-VES-OLDOUTFALL-C | Water | 02/14/18 13:38 | 02/15/18 09:30 |
| 280-106447-5 | FAY-VES-OLDOUTFALL-D | Water | 02/14/18 14:05 | 02/15/18 09:30 |
| 280-106447-6 | FAY-VES-OLDOUTFALL-E | Water | 02/14/18 14:15 | 02/15/18 09:30 |
| 280-106447-7 | FAY-VES-OLDOUTFALLSEEP-A | Water | 02/14/18 13:10 | 02/15/18 09:30 |
| 280-106447-8 | FAY-VES-OLDOUTFALLCREEK-A | Water | 02/14/18 13:22 | 02/15/18 09:30 |
| 280-106447-9 | FAY-VES-OLDOUTFALLCREEK-A2 | Water | 02/14/18 16:30 | 02/15/18 09:30 |
| 280-106447-10 | FAY-VES-OLDOUTFALLCREEK-A3 | Water | 02/14/18 16:45 | 02/15/18 09:30 |
| 280-106447-11 | FAY-VES-OLDOUTFALLCREEKWATERBO | Water | 02/14/18 17:00 | 02/15/18 09:30 |
| 280-106447-12 | FAY-VES-FB-021418 | Water | 02/14/18 07:00 | 02/15/18 09:30 |

# LCMS MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Denver Job No.: 280-106447-1

SDG No.:

Instrument ID: LC_LCMS7 Analysis Batch Number: 404345

Lab Sample ID: STD001 280-404345/3 IC Client Sample ID:

Date Analyzed: 02/08/18 13:05 Lab File ID: hfpo718B08034.d GC Column: Synergi Hydro ID:

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| HFPO-DA | 1.06 | Assign Peak | meyera | 02/08/18 15:19 |

Lab Sample ID: STD002 280-404345/4 IC Client Sample ID:

Date Analyzed: 02/08/18 13:08 Lab File ID: hfpo718B08035.d GC Column: Synergi Hydro ID:

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| HFPO-DA | 1.06 | Baseline | meyera | 02/08/18 15:19 |

Lab Sample ID: DLCK 280-404345/13 Client Sample ID:

Date Analyzed: 02/08/18 13:38 Lab File ID: hfpo718B08044.d GC Column: Synergi Hydro ID:

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| HFPO-DA | 1.06 | Baseline | meyera | 02/08/18 15:20 |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Denver Job No.: 280-106447-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **HFPO I.S._00008** | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| .13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| **HFPO Spike_00004** | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| .HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-0_00032** | 02/22/18 | 02/08/18 | PFC_Dill_Solvent, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| **HFPO_CAL-1_00032** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 0.5 uL | HFPO-DA | 0.25 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-2_00033** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 1 uL | HFPO-DA | 0.5 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-3_00032** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 2 uL | HFPO-DA | 1 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Denver Job No.: 280-106447-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-4_00032** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 4 uL | HFPO-DA | 2 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-5_00080** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 10 uL | HFPO-DA | 5 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-5_00081** | 02/22/18 | 02/20/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00009 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | HFPO Spike_00004 | 10 uL | HFPO-DA | 5 ug/L |
| .HFPO I.S._00009 | 02/20/19 | 02/20/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00009 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| ..13C3 HFPO-DA_00009 | 02/20/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-6_00080** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 20 uL | HFPO-DA | 10 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Denver Job No.: 280-106447-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-6_00081** | 02/22/18 | 02/20/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00009 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | HFPO Spike_00004 | 20 uL | HFPO-DA | 10 ug/L |
| .HFPO I.S._00009 | 02/20/19 | 02/20/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00009 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| ..13C3 HFPO-DA_00009 | 02/20/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-7_00032** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 50 uL | HFPO-DA | 25 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-8_00032** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 100 uL | HFPO-DA | 50 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_CAL-9_00001** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | | | 13C3 HFPO-DA (IS) | 10 ug/L |
| | | | | | HFPO Spike_00004 | 200 uL | HFPO-DA | 100 ug/L |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Denver Job No.: 280-106447-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| | | | | | | | 13C3 HFPO-DA (IS) | 50 ug/mL |
| .HFPO Spike_00004 | 10/30/18 | 10/30/17 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | HFPO-DA_00004 | 1 mL | HFPO-DA | 0.5 ug/mL |
| ..HFPO-DA_00004 | 07/13/20 | Wellington Laboratories, Lot HFPODA0717 | | | (Purchased Reagent) | | HFPO-DA | 50 ug/mL |
| **HFPO_ICV_00034** | 02/22/18 | 02/08/18 | 80:20 Methanol : H2O, Lot 00016 | 1 mL | HFPO I.S._00008 | 20 uL | 13C3 HFPO-DA | 10 ug/L |
| | | | | | HFPO ICV_00001 | 10 uL | HFPO-DA | 1.95009 ug/L |
| .HFPO I.S._00008 | 12/12/18 | 01/30/18 | LCMS Grade MeOH, Lot LCMS_MeOH_00110 | 100 mL | 13C3 HFPO-DA_00008 | 1 mL | 13C3 HFPO-DA | 0.5 ug/mL |
| ..13C3 HFPO-DA_00008 | 01/30/19 | Wellington Laboratories, Lot M3HFPOADA0817 | | | (Purchased Reagent) | | 13C3 HFPO-DA | 50 ug/mL |
| .HFPO ICV_00001 | 11/03/18 | 11/03/17 | Methanol, Lot 12345 | 100 mL | HFPO SS stock_00002 | 20 uL | HFPO-DA | 0.195009 ug/mL |
| ..HFPO SS stock_00002 | 11/03/18 | 11/03/17 | Methanol, Lot 12345 | 500 mL | HFPO SS_00003 | 0.5026 g | HFPO-DA | 975.044 ug/mL |
| ...HFPO SS_00003 | 05/23/21 | Synquest Laboratories, Lot Q141-128 | | | (Purchased Reagent) | | HFPO-DA | 97 % |

# Reagent

# 13C3 HFPO-DA_00008

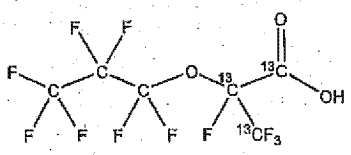
# WELLINGTON LABORATORIES

## CERTIFICATE OF ANALYSIS DOCUMENTATION

**PRODUCT CODE:** M3HFPO-DA **LOT NUMBER:** M3HFPODA0817

**COMPOUND:** 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-$^{13}C_3$-propanoic acid

**STRUCTURE:** **CAS #:** Not available



| | | | |
|---|---|---|---|
| **MOLECULAR FORMULA:** | $^{13}C_3{}^{12}C_3HF_{11}O_3$ | **MOLECULAR WEIGHT:** | 333.03 |
| **CONCENTRATION:** | 50 ± 2.5 µg/ml | **SOLVENT(S):** | Methanol |
| **CHEMICAL PURITY:** | >98% | **ISOTOPIC PURITY:** | ≥99% $^{13}C$ ($^{13}C_3$) |
| **LAST TESTED:** (mm/dd/yyyy) | 08/17/2017 | | |
| **EXPIRY DATE:** (mm/dd/yyyy) | 08/17/2020 | | |
| **RECOMMENDED STORAGE:** | Store ampoule in a cool, dark place | | |

**DOCUMENTATION/DATA ATTACHED:**

Figure 1: LC/MS Data (TIC and Mass Spectrum)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

**ADDITIONAL INFORMATION:**

- See page 2 for further details.
- Contains ~ 1.5% of two constitutional isomers.
- Product is commercially known as GenX.

***FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE***

**Certified By:** _____ **Date:** 08/25/2017 (mm/dd/yyyy)

B.G. Chittim, General Manager

*Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA*
*519-822-2436 • Fax: 519-822-2849 • info@well-labs.com*

## INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compound it contains.

## HAZARDS:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

## SYNTHESIS / CHARACTERIZATION:

Where possible, all of our products are synthesized using single-product unambiguous routes. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

## HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products are compared to older lots in the same manner, which further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

## UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value $y$ and the uncertainty of the independent parameters $x_1, x_2, \ldots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \ldots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

## TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly tested by an external ISO/IEC 17025 accredited calibration company. In addition, their calibration is verified prior to each weighing using calibrated NIST and/or NRC traceable external weights. All volumetric glassware used is calibrated, of Class A tolerance, and has been tested according to the appropriate ASTM procedures, which are ultimately traceable to NIST. For certain products, traceability to international interlaboratory studies has also been established.

## EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

## LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

## QUALITY MANAGEMENT:

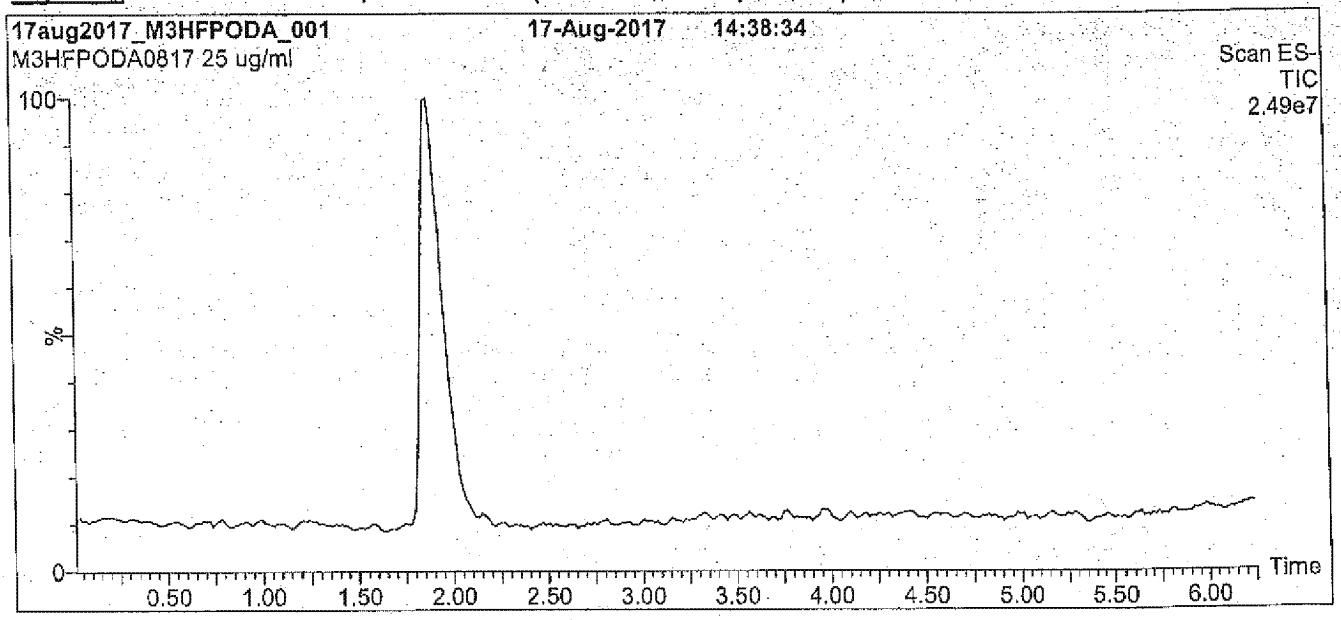
This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A 1226), and ISO GUIDE 34 by ANSI-ASQ National Accreditation Board (ANAB; AR-1523).

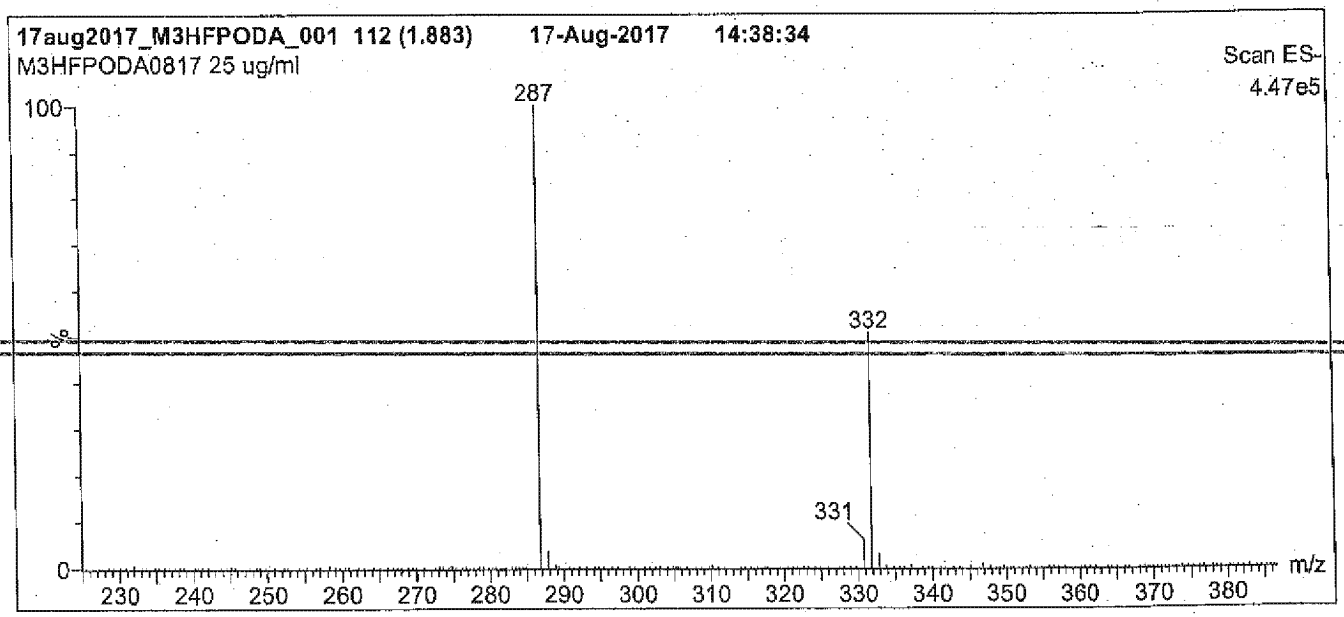
CALA Testing Accreditation No. A1226

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER

**For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com**

**Figure 1:** **M3HFPO-DA; LC/MS Data (TIC and Mass Spectrum)**




**Conditions for Figure 1:**

**LC:** **Waters Acquity Ultra Performance LC**
**MS:** **Micromass Quattro *micro* API MS**

**Chromatographic Conditions**

Column: Acquity UPLC BEH Shield $RP_{18}$
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 55% MeOH / 45% $H_2O$ with 10 mM $NH_4OAc$ buffer
Ramp to 90% organic over 7.5 min and hold for 1.5 min
before returning to initial conditions in 0.5 min.

Time: 10 min

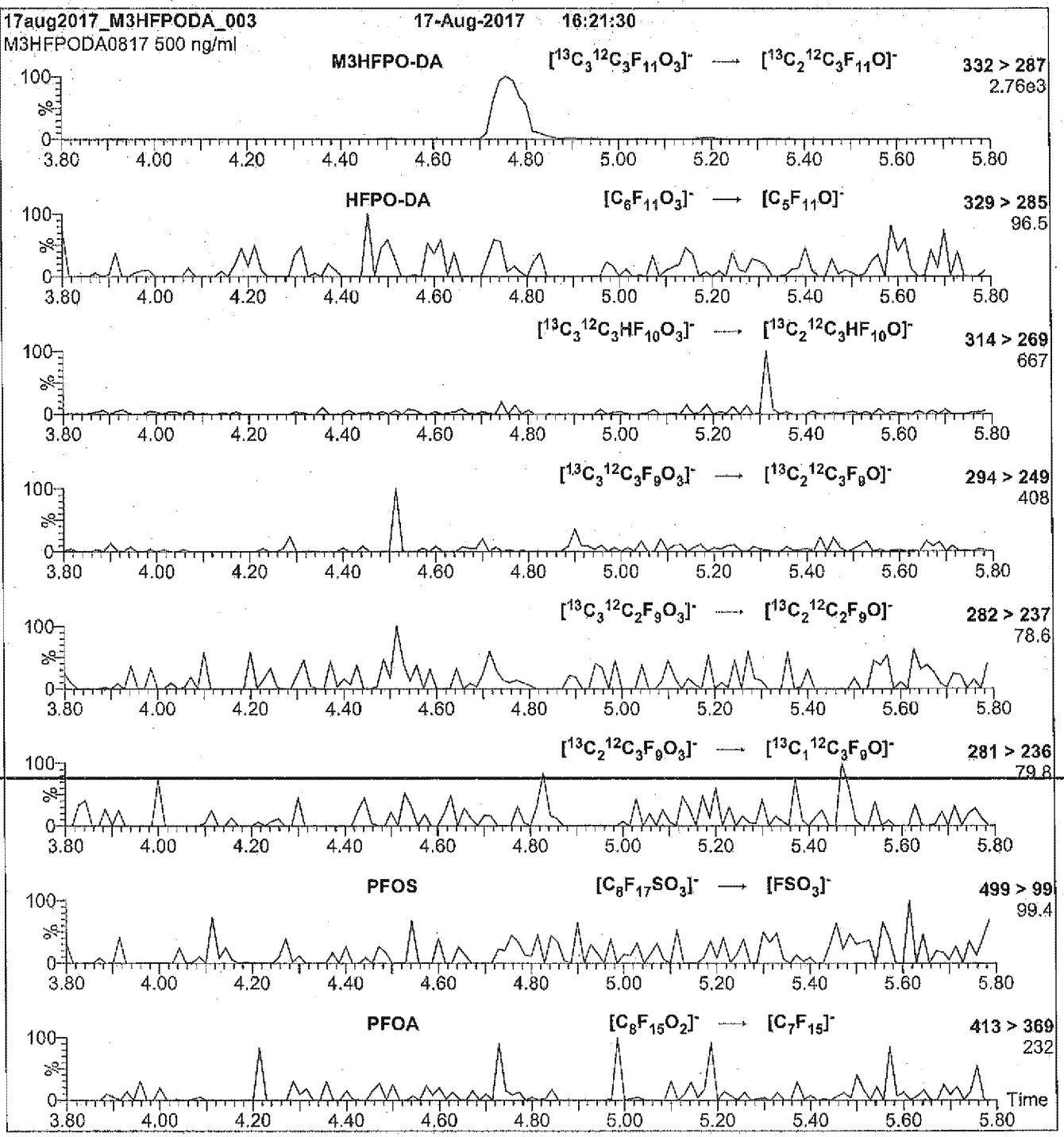
Flow: 300 µl/min

**MS Parameters**

Experiment: Full Scan (225 - 850 amu)

Source: Electrospray (negative)
Capillary Voltage (kV) = 3.00
Cone Voltage (V) = 10.00
Cone Gas Flow (l/hr) = 100
Desolvation Gas Flow (l/hr) = 750

**Figure 2:** **M3HFPO-DA; LC/MS/MS Data (Selected MRM Transitions)**




**Conditions for Figure 2:**

Injection: Direct loop injection
10 µl (500 ng/ml M3HFPO-DA)

Mobile phase: Isocratic 80% MeOH / 20% $H_2O$ with 10 mM $NH_4OAc$ buffer

Flow: 300 µl/min

**MS Parameters**

Collision Gas (mbar) = 3.24e-3
Collision Energy (eV) = 5

# Reagent

# 13C3 HFPO-DA_00009

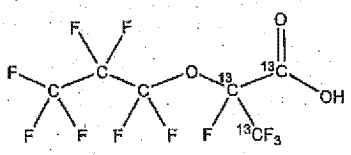
# WELLINGTON LABORATORIES

## CERTIFICATE OF ANALYSIS DOCUMENTATION

**PRODUCT CODE:** M3HFPO-DA **LOT NUMBER:** M3HFPODA0817

**COMPOUND:** 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-$^{13}C_3$-propanoic acid

**STRUCTURE:** **CAS #:** Not available



| | | | |
|---|---|---|---|
| **MOLECULAR FORMULA:** | $^{13}C_3{}^{12}C_3HF_{11}O_3$ | **MOLECULAR WEIGHT:** | 333.03 |
| **CONCENTRATION:** | 50 ± 2.5 µg/ml | **SOLVENT(S):** | Methanol |
| **CHEMICAL PURITY:** | >98% | **ISOTOPIC PURITY:** | ≥99% $^{13}C$ ($^{13}C_3$) |
| **LAST TESTED:** (mm/dd/yyyy) | 08/17/2017 | | |
| **EXPIRY DATE:** (mm/dd/yyyy) | 08/17/2020 | | |
| **RECOMMENDED STORAGE:** | Store ampoule in a cool, dark place | | |

**DOCUMENTATION/DATA ATTACHED:**

Figure 1: LC/MS Data (TIC and Mass Spectrum)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

**ADDITIONAL INFORMATION:**

- See page 2 for further details.
- Contains ~ 1.5% of two constitutional isomers.
- Product is commercially known as GenX.

***FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE***

**Certified By:** _____ **Date:** 08/25/2017 (mm/dd/yyyy)

B.G. Chittim, General Manager

*Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA*
*519-822-2436 • Fax: 519-822-2849 • info@well-labs.com*

## INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compound it contains.

## HAZARDS:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

## SYNTHESIS / CHARACTERIZATION:

Where possible, all of our products are synthesized using single-product unambiguous routes. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

## HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products are compared to older lots in the same manner, which further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

## UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value $y$ and the uncertainty of the independent parameters $x_1, x_2, \ldots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \ldots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

## TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly tested by an external ISO/IEC 17025 accredited calibration company. In addition, their calibration is verified prior to each weighing using calibrated NIST and/or NRC traceable external weights. All volumetric glassware used is calibrated, of Class A tolerance, and has been tested according to the appropriate ASTM procedures, which are ultimately traceable to NIST. For certain products, traceability to international interlaboratory studies has also been established.

## EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

## LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

## QUALITY MANAGEMENT:

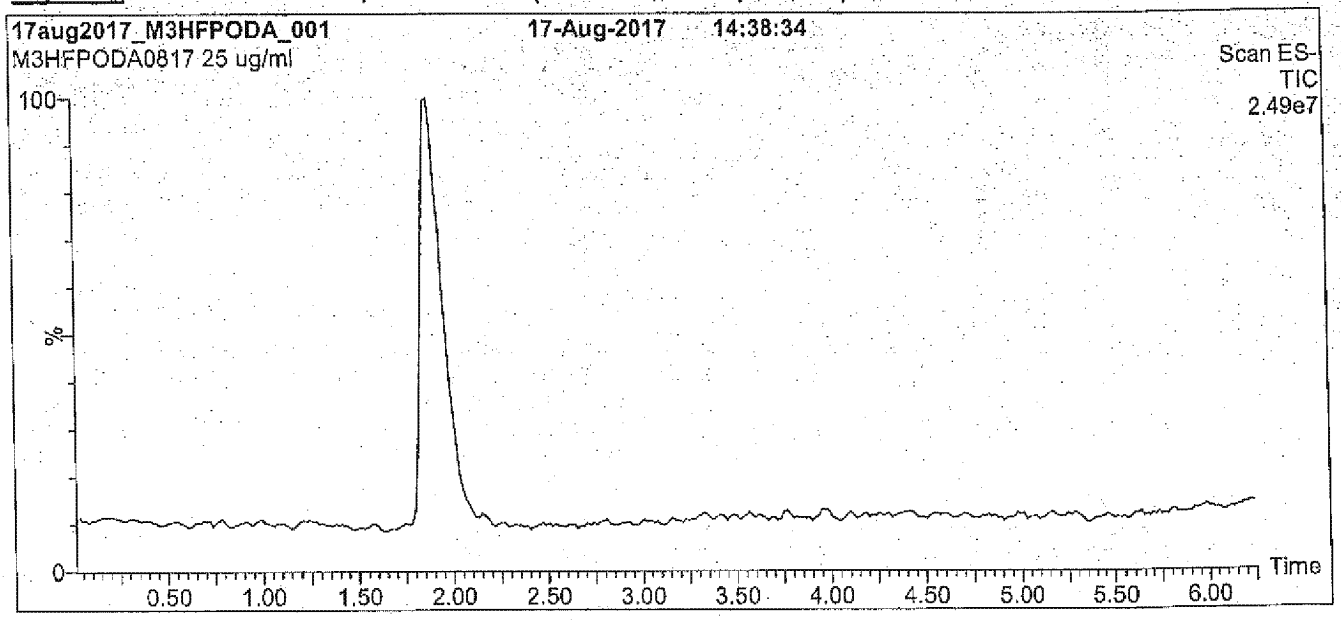
This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A 1226), and ISO GUIDE 34 by ANSI-ASQ National Accreditation Board (ANAB; AR-1523).

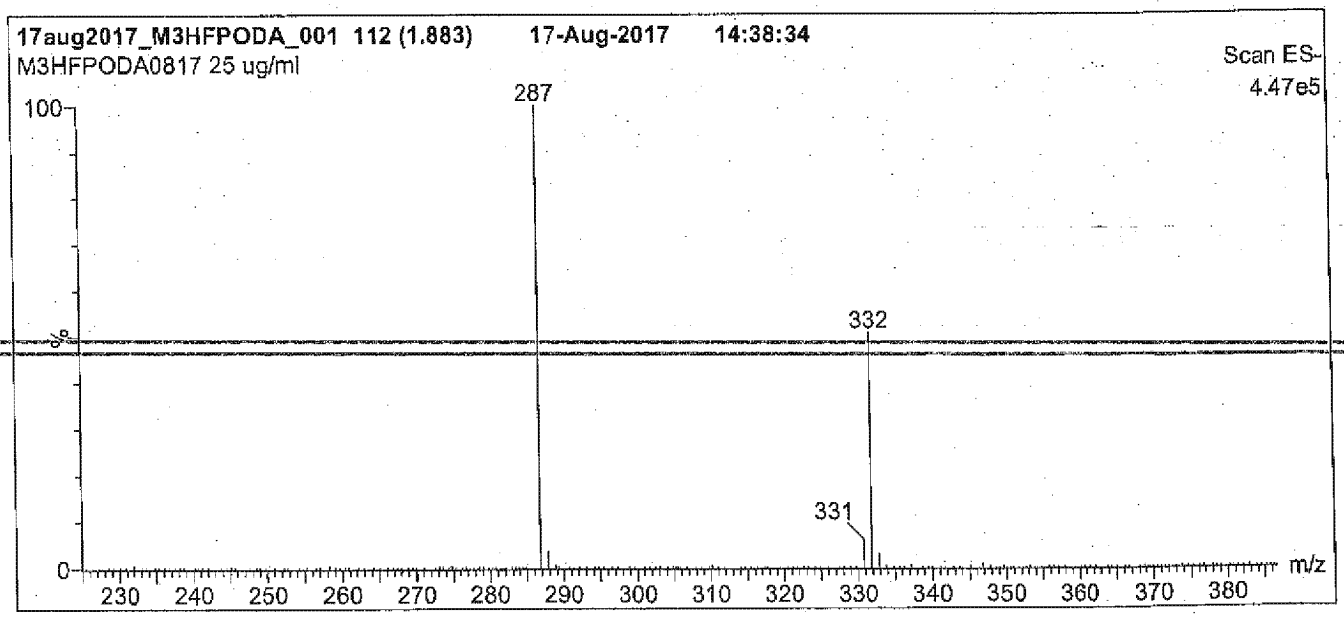
CALA Testing Accreditation No. A1226

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER

**For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com**

**Figure 1:** **M3HFPO-DA; LC/MS Data (TIC and Mass Spectrum)**




**Conditions for Figure 1:**

**LC:** **Waters Acquity Ultra Performance LC**
**MS:** **Micromass Quattro *micro* API MS**

**Chromatographic Conditions**

Column: Acquity UPLC BEH Shield $RP_{18}$
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 55% MeOH / 45% $H_2O$ with 10 mM $NH_4OAc$ buffer
Ramp to 90% organic over 7.5 min and hold for 1.5 min
before returning to initial conditions in 0.5 min.

Time: 10 min

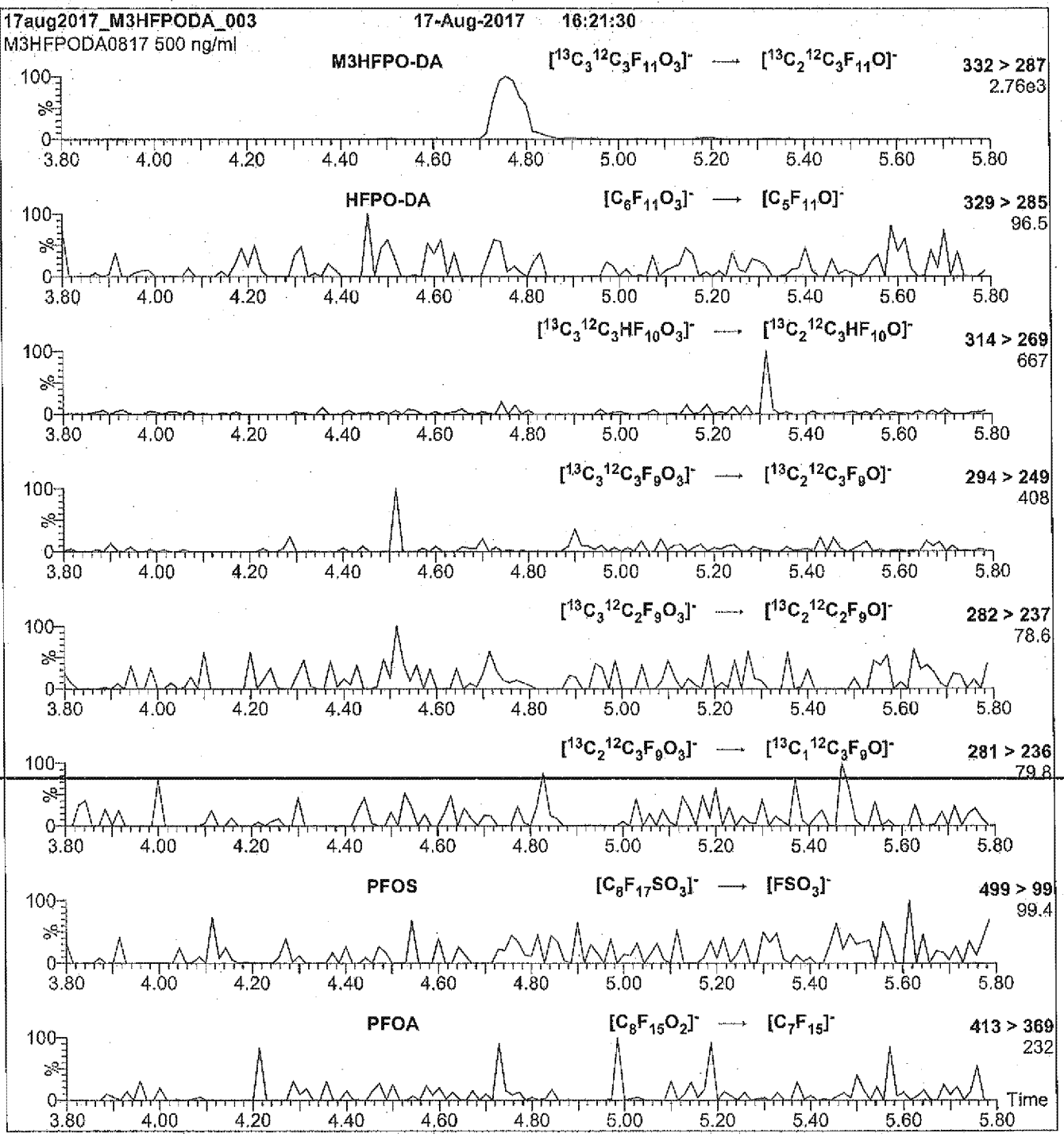
Flow: 300 µl/min

**MS Parameters**

Experiment: Full Scan (225 - 850 amu)

Source: Electrospray (negative)
Capillary Voltage (kV) = 3.00
Cone Voltage (V) = 10.00
Cone Gas Flow (l/hr) = 100
Desolvation Gas Flow (l/hr) = 750

**Figure 2:** **M3HFPO-DA; LC/MS/MS Data (Selected MRM Transitions)**




**Conditions for Figure 2:**

Injection: Direct loop injection
10 µl (500 ng/ml M3HFPO-DA)

Mobile phase: Isocratic 80% MeOH / 20% $H_2O$ with 10 mM $NH_4OAc$ buffer

Flow: 300 µl/min

**MS Parameters**

Collision Gas (mbar) = 3.24e-3
Collision Energy (eV) = 5

# Reagent

# HFPO-DA_00004

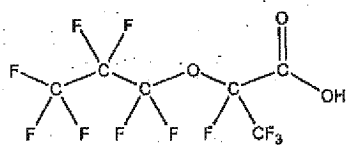
# WELLINGTON LABORATORIES

## CERTIFICATE OF ANALYSIS DOCUMENTATION

**PRODUCT CODE:** HFPO-DA **LOT NUMBER:** HFPODA0717

**COMPOUND:** 2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid

**STRUCTURE:** **CAS #:** 13252-13-6



| | | | |
|---|---|---|---|
| **MOLECULAR FORMULA:** | $C_6HF_{11}O_3$ | **MOLECULAR WEIGHT:** | 330.05 |
| **CONCENTRATION:** | 50 ± 2.5 µg/ml | **SOLVENT(S):** | Methanol |
| **CHEMICAL PURITY:** | >98% | | |
| **LAST TESTED:** (mm/dd/yyyy) | 07/13/2017 | | |
| **EXPIRY DATE:** (mm/dd/yyyy) | 07/13/2020 | | |
| **RECOMMENDED STORAGE:** | Store ampoule in a cool, dark place | | |

**DOCUMENTATION/ DATA ATTACHED:**

Figure 1: LC/MS Data (TIC and Mass Spectrum)
Figure 2: LC/MS/MS Data (Selected MRM Transitions)

**ADDITIONAL INFORMATION:**

- See page 2 for further details.
- Product is commercially known as GenX.

***FOR LABORATORY USE ONLY: NOT FOR HUMAN OR DRUG USE***

**Certified By:** _____ **Date:** 07/14/2017 (mm/dd/yyyy)
B.G. Chittim, General Manager

*Wellington Laboratories Inc., 345 Southgate Dr. Guelph ON N1G 3M5 CANADA*
*519-822-2436 • Fax: 519-822-2849 • info@well-labs.com*

## INTENDED USE:

The products prepared by Wellington Laboratories Inc. are for laboratory use only. This certified reference material (CRM) was designed to be used as a standard for the identification and/or quantification of the specific chemical compound it contains.

## HAZARDS:

This product should only be used by qualified personnel familiar with its potential hazards and trained in the handling of hazardous chemicals. Due care should be exercised to prevent unnecessary human contact or ingestion. All procedures should be carried out in a well-functioning fume hood and suitable gloves, eye protection, and clothing should be worn at all times. Waste should be disposed of according to national and regional regulations. Safety Data Sheets (SDSs) are available upon request.

## SYNTHESIS / CHARACTERIZATION:

Where possible, all of our products are synthesized using single-product unambiguous routes. They are then characterized, and their structures and purities confirmed, using a combination of the most relevant techniques, such as NMR, GC/MS, LC/MS/MS, SFC/UV/MS/MS, x-ray crystallography, and melting point. Isotopic purities of mass-labelled compounds are also confirmed using HRGC/HRMS and/or LC/MS/MS.

## HOMOGENEITY:

Prior to solution preparation, crystalline material is tested for homogeneity using a variety of techniques (as stated above) and its solubility in a given diluent is taken into consideration. Duplicate solutions of a new product are prepared from the same crystalline lot and, after the addition of an appropriate internal standard, they are compared by GC/MS, LC/MS/MS and/or SFC/UV/MS/MS. The relative response factors of the analyte of interest in each solution are required to be <5% RSD. New solution lots of existing products are compared to older lots in the same manner, which further confirms the homogeneity of the crystalline material as well as the stability and homogeneity of the solutions in the storage containers. In order to maintain the integrity of the assigned value(s), and associated uncertainty, the dilution or injection of a subsample of this product should be performed using calibrated measuring equipment.

## UNCERTAINTY:

The maximum combined relative standard uncertainty of our reference standard solutions is calculated using the following equation:

The combined relative standard uncertainty, $u_c(y)$, of a value $y$ and the uncertainty of the independent parameters $x_1, x_2, \ldots x_n$ on which it depends is:

$$u_c(y(x_1, x_2, \ldots x_n)) = \sqrt{\sum_{i=1}^{n} u(y, x_i)^2}$$

where x is expressed as a relative standard uncertainty of the individual parameter.

The individual uncertainties taken into account include those associated with weights (calibration of the balance) and volumes (calibration of the volumetric glassware). An expanded maximum combined percent relative uncertainty of ±5% (calculated with a coverage factor of 2 and a level of confidence of 95%) is stated on the Certificate of Analysis for all of our products.

## TRACEABILITY:

All reference standard solutions are traceable to specific crystalline lots. The microbalances used for solution preparation are regularly tested by an external ISO/IEC 17025 accredited calibration company. In addition, their calibration is verified prior to each weighing using calibrated NIST and/or NRC traceable external weights. All volumetric glassware used is calibrated, of Class A tolerance, and has been tested according to the appropriate ASTM procedures, which are ultimately traceable to NIST. For certain products, traceability to international interlaboratory studies has also been established.

## EXPIRY DATE / PERIOD OF VALIDITY:

Ongoing stability studies of this product have demonstrated stability in its composition and concentration, until the specified expiry date, in the unopened ampoule. Monitoring for any degradation or change in concentration of the listed analyte(s) is performed on a routine basis.

## LIMITED WARRANTY:

At the time of shipment, all products are warranted to be free of defects in material and workmanship and to conform to the stated technical and purity specifications.

## QUALITY MANAGEMENT:

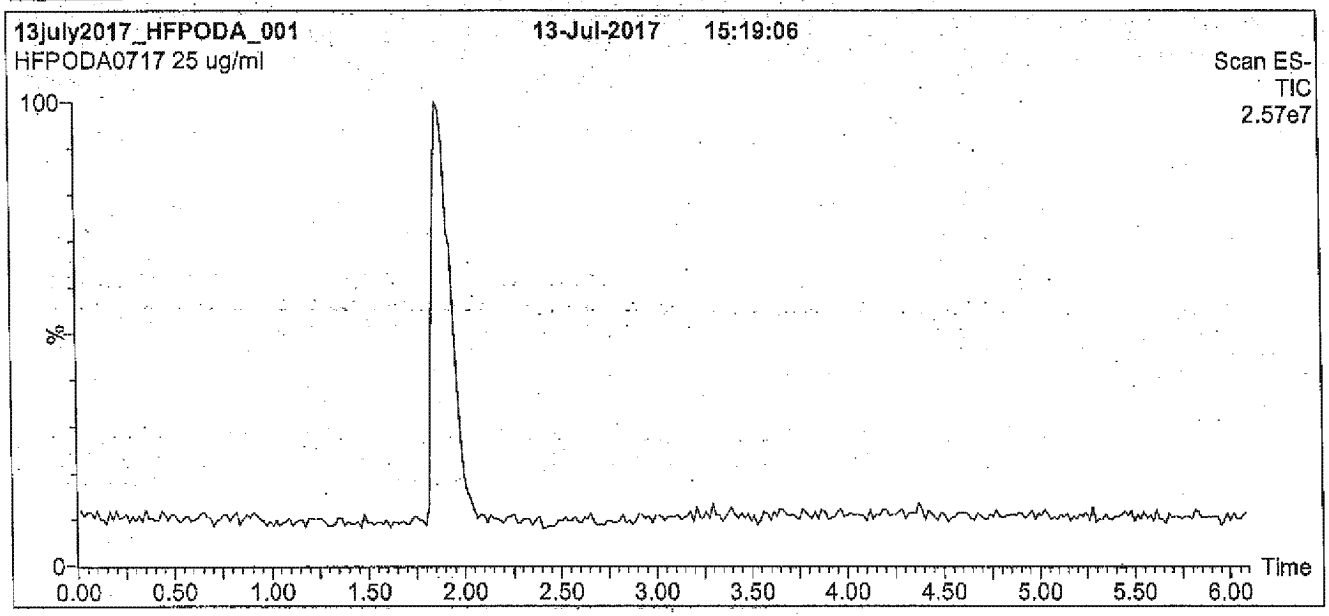
This product was produced using a Quality Management System registered to the latest versions of ISO 9001 by SAI Global, ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA; A 1226), and ISO GUIDE 34 by ANSI-ASQ National Accreditation Board (ANAB; AR-1523).

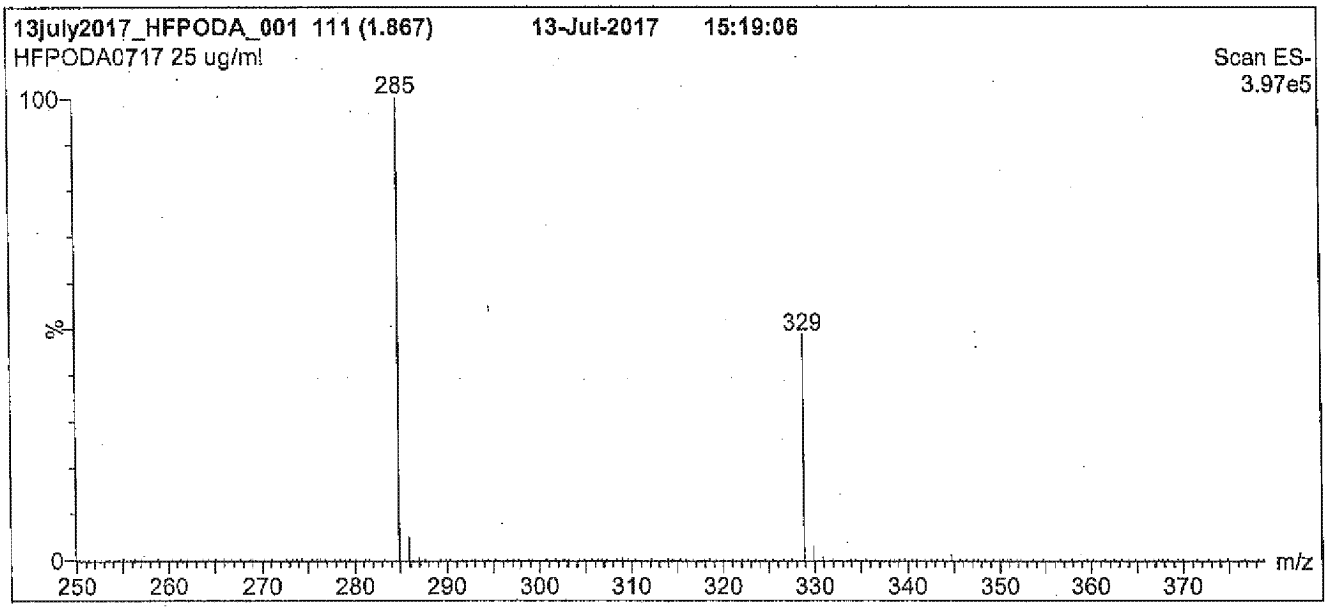
CALA Testing Accreditation No. A1226

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER

**For additional information or assistance concerning this or any other products from Wellington Laboratories Inc., please visit our website at www.well-labs.com or contact us directly at info@well-labs.com**

**Figure 1:** **HFPO-DA; LC/MS Data (TIC and Mass Spectrum)**




**Conditions for Figure 1:**

**LC:** **Waters Acquity Ultra Performance LC**
**MS:** **Micromass Quattro *micro* API MS**

**Chromatographic Conditions**

Column: Acquity UPLC BEH Shield $RP_{18}$
1.7 µm, 2.1 x 100 mm

Mobile phase: Gradient
Start: 55% MeOH / 45% $H_2O$ with 10 mM $NH_4OAc$ buffer
Ramp to 90% organic over 7.5 min and hold for 1.5 min
before returning to initial conditions in 0.5 min.

Time: 10 min

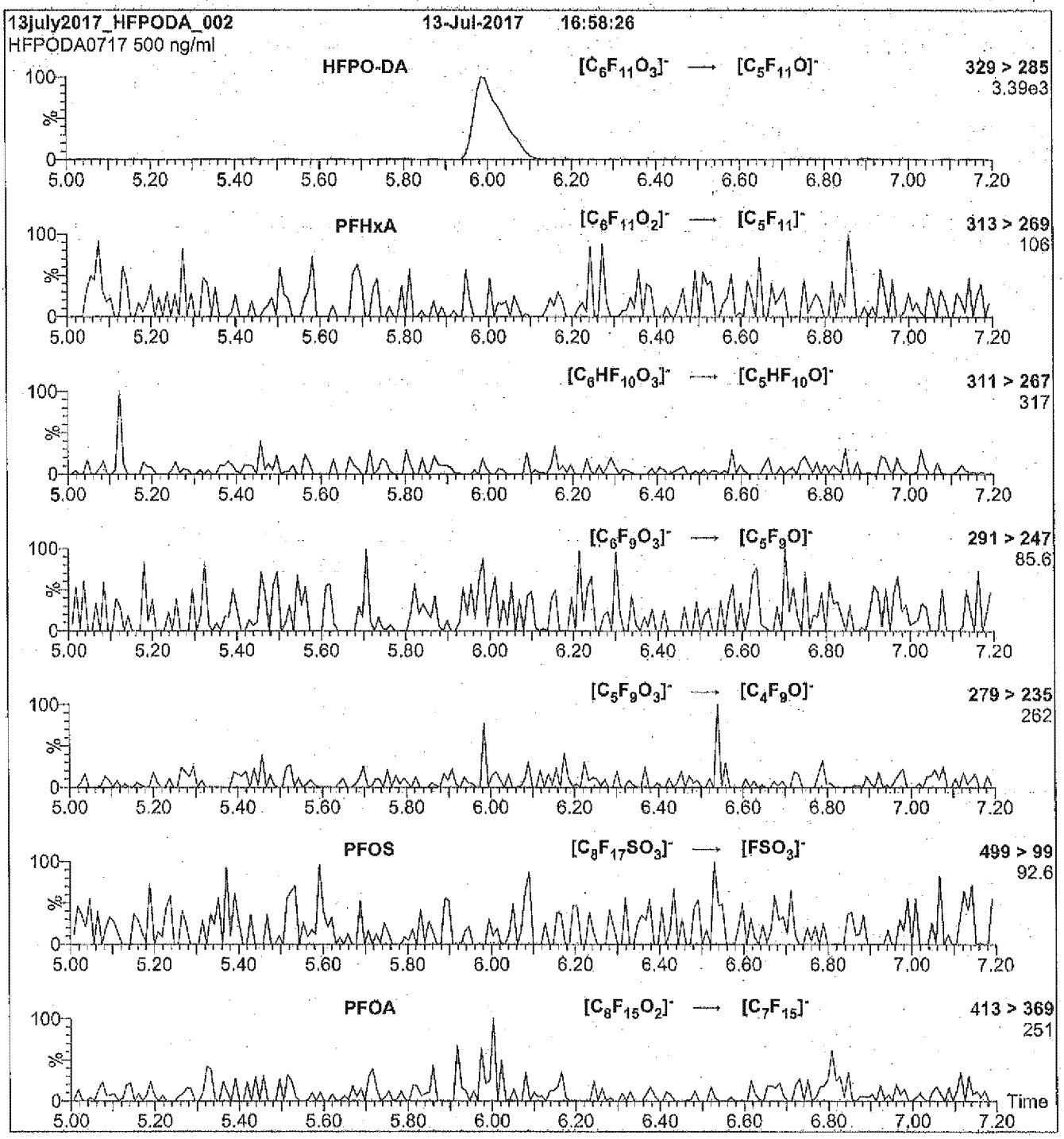
Flow: 300 µl/min

**MS Parameters**

Experiment: Full Scan (250 - 850 amu)

Source: Electrospray (negative)
Capillary Voltage (kV) = 3.00
Cone Voltage (V) = 10.00
Cone Gas Flow (l/hr) = 100
Desolvation Gas Flow (l/hr) = 700

**Figure 2:** **HFPO-DA; LC/MS/MS Data (Selected MRM Transitions)**




**Conditions for Figure 2:**

Injection: Direct loop injection
10 µl (500 ng/ml HFPO-DA)

Mobile phase: Isocratic 80% MeOH / 20% $H_2O$ with 10 mM $NH_4OAc$ buffer

Flow: 300 µl/min

**MS Parameters**

Collision Gas (mbar) = 3.20e-3
Collision Energy (eV) = 5

# 8321A_HFPO_Du

## HFPO-DA